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NOTES ON A COLLECTION OF ROCKS FROM HONDURAS, CENTRAL AMERICA

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Introduction.—The rocks described in this paper were collected by Dr. Sidney Powers during the summer of 1917 from the province of Atlantida, northwestern Honduras, and from the outlying island of Utilla. A summary of the general geology of the region is given in the paper preceding this by Doctor Powers. A high range of mountains composed of batholithic intrusions of granodiorites, the Sierra de Pija, extends along the northern border of Honduras and sends radiating spurs toward the coast. Most of the rocks were collected from stream valleys cutting the northern slopes of these mountains.

The chief centers from which collections were made are Tela, Puerto Cortez, San Pedro Sula, La Ceiba, and Nueva Armenia. These towns are shown in Fig. 2 of the preceding article. The island of Utilla lies 20 miles off the coast and is one of the Bay Islands.

Rocks from Utilla Island.—Utilla is largely fashioned from Quaternary basalts. The basalt which occurs back of the town of Utilla is gray black in color, some of it dense, some of it vesicular. In certain varieties the feldspars abound; in others augite and olivine phenocrysts are more abundant. The groundmass has an ophitic texture and is composed of andesine, augite, and olivine. The feldspar phenocrysts are zoned and have the composition of basic andesine and medium labradorite. Basalts from Stuert Hill, which is probably the center from which the flows came, are similar to the type just described, but are more vesicular and impregnated by calcite. Stuert Hill is composed principally of agglomerate.

Pumpkin Hill, 1½ miles southwest of the town Utilla, is underlain by tuff composed of coarse bits of lapilli and angular fragments of coral limestone set in a paste of yellowish white ash. The vesicles of basalt are filled with opal, showing that the rock has been thoroughly leached since its deposition on a tuff cone in relatively shallow water.

Rocks from the Tela district.—Near the town of Tela there are a large variety of igneous and metamorphic rocks which are more or less intimately connected by transitional facies. The igneous types vary from granodiorites to gabbros. At the western end of the native village the hills are composed of medium- to fine-grained augite diorites cut by occasional quartz veins. The diorites are composed of basic oligoclase feldspar, biotite, diallage, and accessory apatite and magnetite. Three miles west of Tela, Triunfo Point is formed by a hill of true diorite which varies greatly in size of grain within a few feet. The diorite is black and white in color and consists of acid labradorite, common hornblende (pleochroic olive green to yellow), and accessory magnetite. Similar diorites are exposed in a cut along the Tela Railroad 7 miles west of Tela, and in the headland Bishop Point, 5 miles west of Triunfo Point, the last rocky point for 70 miles to the west. South of Tela, toward the mountains which are locally called the Shark Mountains, felsodacites outcrop in Tela valley associated with dioritic gabbros. The felsodacite is dirty buff in color and contains small phenocrysts of quartz and larger phenocrysts (3 to 8 mm.) of feldspar. The microscope shows that in the recrystallized mosaic of quartz and feldspar myrmikitic intergrowths are common.

A large number of rocks were collected in the Quemada Hills on the west side of Micos Lagoon and about 12 miles east of Tela. The accompanying sketch map (Fig. 1) shows the principal points visited. Typical diorites, such as compose Triunfo Point, outcrop on Mũnos Hill. Philipe Hill is composed of a sheared granodiorite, light gray in color. Under the microscope the rock shows a mosaic texture. Quartz and orthoclase with oligoclase are the chief minerals, but minute flecks of hornblende are abundant and titanite and apatite are present. Apparently intrusive into the granodiorite, since it is less sheared, is a basic diorite composed of labradorite ($Ab_{40}An_{60}$) and a hornblende which is pleochroic, bluish green to light yellow. Apatite and pyrite are also present.

Diorites outcrop on Leandro Hill, and coarse-grained types with large hornblende crystals occur in the valley southwest of this hill. Medium-grained gabbros rich in labradorite, which gives them a greasy, brown appearance, are found on Frijole Hill.

Along Cow Creek and the adjacent creek on the west, Leandro, a series of metamorphic rocks largely derived from tonalites or diorites is found. Pegmatitic facies of the tonalite composed of quartz, orthoclase, and black tourmaline are common in the valley near locality (1) (Fig. 1). At locality (2) a dioritic orthogneiss outcrops. The rock is dark gray in color and is composed of sheared oligoclase feldspar in parallel bands with quartz veinlets. Parallel fine needles of hornblende add to the banded effect and bend about occasional phenocrysts of feldspar. An epidote orthogneiss occurs near locality (3). It is composed of epidote, hornblende, and labradorite and is banded gray and black in color. A greasy mica schist outcrops at locality (4). The paper-thin, crenulated bands of muscovite bend about brecciated crystals of oligoclase which appear as small "augen" inclusions on the cross-fractured rock.

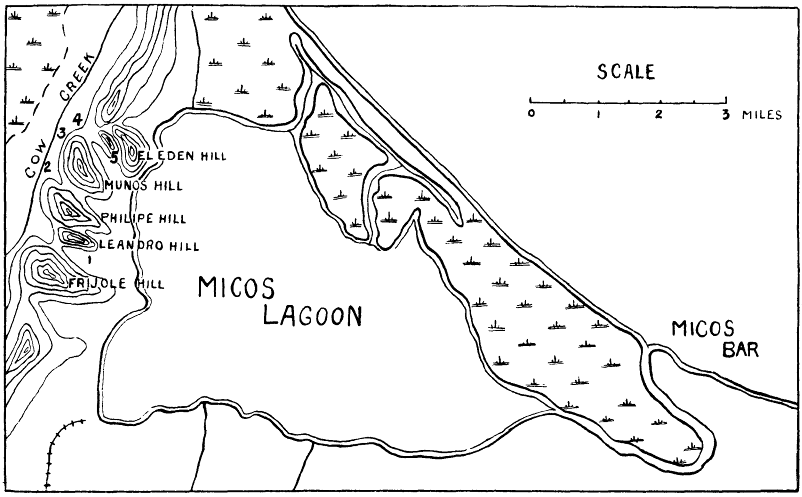

FIG. 1.—Map of vicinity of Micos Lagoon, Northwest of Tela, Honduras

On El Eden Hill, locality (5), hornblendite outcrops north of a ridge of quartzite which is tilted on end. The hornblendites were undoubtedly derived from the metamorphism of diorites. They are composed of andesine and a hornblende which is pleochroic light yellow and olive green to bluish green. Associated with the hornblendites are dioritic biotite orthogneisses.

Along the Tela Railroad 14 and 16 miles east of Tela sedimentary quartzites and gneisses are exposed, while at Uraca, 56 miles southeast of Tela by rail, medium- to coarse-grained tonalites composed of quartz, oligoclase, and a little hornblende outcrop over a large area. The tonalites extend eastward past San Pedro Sula.

Rocks from Puerto Cortez and vicinity.—The region about Puerto Cortez has been built by shoreward currents and by the vegetation in swamps. But across the bay the waves have exposed a series of Tertiary sandstones which are greenish gray when fresh, but which oxidize to a limonitic clay. They are composed of very fine grains of quartz and muscovite mingled with an equal proportion of glauconite particles. The rock is gritty and friable and hence is quite like a typical green sand both in color and texture.

Proceeding southward along the Honduras National Railroad from Puerto Cortez volcanic rocks similar to those on the island of Utilla overlie sheared felsodacites at Chameleconcito. The particular specimen collected is a dense porphyritic basalt composed of large phenocrysts of labradorite, olivine, and augite set in a cryptocrystalline groundmass of the same minerals associated with magnetite dust.

At Baracoa specimens of an even, fine-grained, dioritic gneiss were found associated with an actinolite gneiss composed entirely of actinolite in rosettes of radiating fibers. Near La Pimienta there are chocolate-colored felsites which show a flow structure and carry small phenocrysts of oligoclase feldspar. When decomposed they form a residual clay very free from iron compounds. They have not been sheared or folded like the other felsites described because they are much younger—probably post-Cretaceous.

Rocks from Landslide Valley, San Pedro Sula.—On account of residual soils fresh rocks are seldom found in Honduras. An exception to this rule occurs, however, in the valley southeast of San Pedro Sula conspicuous for the large bare face of a mountain left by a landslide. Here bronze-colored biotite schists are associated with diorites. The schist is composed of paper-thin layers of biotite bending around augen crystals of oligoclase and is similar to the schist occurring west of Micos Lagoon, near Tela, save·that the mica is predominatingly biotite instead of muscovite. The microscope reveals a granular paste of fine quartz with rosettes of muscovite and parallel plates of chestnut-brown biotite. The diorite is a medium- to coarse-grained variety whose relation to the schist is unknown. Occasionally the diorite is sheared and epidotized.

Rocks from La Ceiba and vicinity.—Among the streams extending from the coast into the hills southeast of La Ceiba, the nearest is Rio Danto. A number of river pebbles were collected from its bed and one specimen was collected from an outcrop in the stream. The pebbles came from the higher interior hills near the headwaters of the coastal streams and were largely tonalites or allied types. The residual bowlders show that the region about La Ceiba is underlain by agglomerates and flows of acid rocks which toward the east around Tela are transformed into gneisses and schists by dynamic metamorphism. A tuffaceous agglomerate containing pebbles of felsodacite is much epidotized, but the microscope shows phenocrysts of oligoclase-albite replaced in part by a mosaic groundmass of small quartz particles. A trachyandesite from the same locality, outcropping in the river, is light yellow to buff in color and shows a slight flow structure. The thin section shows phenocrysts of oligoclase-albite which are not distinct in the hand specimen. The groundmass is composed of a fine mosaic of feldspar and quartz and occasionally there are nests of feldspar in trachytic arrangement.

From the hills north of Rubber Grove, a station on Vaccaro Brothers Railroad, 5 miles southeast of La Ceiba, aporhyolites and rhyolitic agglomerates were obtained. The agglomerates are composed of red pebbles of aporhyolite and jasper bound together by a red quartzose cement.

The Congrejal River flows into the ocean past the town of La Ceiba. Along its lower course acid flow rocks are exposed, but farther south among the mountains it cuts tonalites and granodiorites. Near the town a rounded hill is composed of felsodacite intruded by diorite. The diorite is a medium- to coarse-grained type consisting of hornblende and oligoclase. The hornblende is pleochroic, chestnut brown to light yellow. The oligoclase is occasionally replaced along the albite twinning planes by magnetite. Tonalite porphyries containing phenocrysts of quartz and oligoclase in a glassy groundmass are frequently exposed, as are also agglomerates containing pebbles of the porphyries.

A biotitic tonalite collected 8 miles up the Congrejal valley at an elevation of about 300 feet is pure white in color and coarsely crystalline. It consists of predominating oligoclase feldspar and quartz with occasional flakes and bunches of biotite a centimeter in diameter. A granodiorite which consists of oligoclase-albite, microcline, quartz, and hornblende was collected near the same locality. The rock has been subjected to great strain and the cracks are filled by a mass of small quartz crystals. The tonalite is seen in the field to be cut by the granodiorite, but the contact shows very little chilling of the latter rock. A dark-greenish porphyry cutting the granodiorite and a breccia composed of fragments of granodiorite in a granular matrix, but of uncertain relationship to the other rocks, are seen south of large exposures of the granodiorite in the river bed. North of these exposures, about 5 miles up the valley, quartz veins are very abundant, cutting a rock which looks like a hydromica schist, but which is probably a metamorphosed igneous rock.

Near the mouth of the Masica valley, 25 miles southeast of La Ceiba, there are found tonalites and allied rocks similar to those exposed in the Congrejal valley, but here associated with basic types. An olivine diabase was collected which is composed of labradorite, augite, olivine, biotite, a little brown hornblende, and pyrite. A coarse-grained black wehrlite was also found consisting of olivine and augite in about equal proportions and a very small amount of labradorite. The olivine crystals often include rounded and resorbed bits of augite.

At San Francisco, 15 miles southeast of La Ceiba, basalt porphyry bowlders with labradorite phenocrysts 2 to 3 cm. in diameter were picked up in the stream bed. A granodiorite collected from this vicinity has approximately the following composition:

	Percentage		Percentage
Oligoclase	50	Biotite	4
Orthoclase	20	Hornblende	1
Quartz	25		
			100

Rocks from the vicinity of Nueva Armenia.—Hot springs in the hills 5 miles south of Nueva Armenia and 1½ miles east of the Tropical Timber Company's railroad well up through tonalites and have kaolinized these rocks extensively. The fresh tonalite is a light-gray rock consisting of oligoclase, quartz, and hornblende. Gneissic varieties of the tonalite are found associated with coarse-grained diorites composed of oligoclase and hornblende. One specimen of the diorite shows a small amount of biotite.

Summary.—The igneous and metamorphic rocks collected from the province of Atlantida, Honduras, include the following types:

- Granular rocks
    - Granodiorite
    - Tonalite
        - Biotite tonalite
        - Pegmatite tonalite
    - Diorite
        - Augite diorite
    - Gabbro
        - Dioritic gabbro
    - Wehrlite
- Cryptocrystalline and glassy rocks
    - Aporhyolite
    - Felsite and agglomerate
    - Tonalite porphyry
    - Felsodacite and agglomerate
    - Trachyandesite
    - Olivine basalt, agglomerate, and tuff
- Metamorphic rocks
    - Dioritic orthogneiss
    - Epidote orthogneiss
    - Actinolite gneiss
    - Hornblendite
    - Biotite schist
    - Quartzite

The granular types occur largely near the summits and on the north slope of the mountains forming the Sierra de Pija, while the extrusive types are found near the coast. The geologic events in the history of the region as revealed by the rocks studied may be epitomized as follows:

1. Intrusion of granodiorites and tonalites accompanied by the extrusion of allied rock types.
2. Folding.
3. Intrusion of diabases and diorites.
4. Faulting and crushing.
5. Extrusion of olivine basalts.